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Division of Mycology and Disease Survey

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BUREAU OF PLANT INDUSTRY

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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XIX August 15, 1935 Number 13

PRESENT STATUS OF THE DUTCH ELM DISEASE

(The Bureau of Entomology and Plant Quarantine has furnished the following statement concerning the present distribution of the Dutch elm disease caused by Ceratostomella ulmi and the progress of eradication. The report is for the week ending August 3).

Introduction

Seven large elms in Indianapolis and two small trees in Norfolk were confirmed as infected during the week. Finding of trees outside the infected areas in New Jersey and New York required extensions of the work areas. Production during the week totalled 393 confirmed trees and 7,659 dead and dying elms. A total of 2,175 suspects was collected by 597 scout crews. Confirmations returned by the laboratory numbered 408.

Systematic Scouting

Returns from the laboratory during the week disclosed 9 confirmed trees at isolated cities. Seven of these diseased elms are in Indianapolis and 2 in Norfolk. The Indianapolis diseased trees are all located in the section of approximately 1 sq. mi. in which 4 infected trees were detected last year. State Entomologist Frank N. Wallace is making arrangements for removal of these trees on August 6. The Indianapolis infections are all in large elms, which now exhibit severe wilting. Many other wilted elms have been sampled in this section, but no additional confir-

mations have been thus far received. The two small diseased trees in Norfolk are in the same general section in which the single diseased tree was found in 1934.

Three hundred and ten New Jersey scout crews worked 2,003 man-days, covered 304 square miles, collected 677 suspects, and tagged 622 dead and dying trees. Eighty-eight of these crews worked in the 10-mile protective zone.

The first survey of the New Jersey area is progressing rapidly. By August 10, the second go-over will be started in a large portion of areas having heavy concentrations of the disease.

Two newly confirmed trees in New Jersey extend the line enclosing infections and the boundary of the protective zone for about 10 miles to the north-west in Passaic and Sussex counties, along the northern boundary of the State. The confirmations add an additional 73.42 square miles to the New Jersey work area in Sussex county. One of the trees is located in Passaic county area 32, square 2, 3/4 mile east of New Milford, East Milford Township. The other tree is located entirely outside the former work area, in Vernon Township on Warwick Road, midway between Vernon, N.J., and New Milford, N. Y., on the west side of highway and east of the Lehigh and Hudson Railroad. New areas and squares have been established to take care of these additions.

Confirmation of an elm located near Harriman, Orange County, N.Y., extended the work area in the State to approximately 1,840 square miles. The tree is located approximately 9.5 miles from the nearest known infection.

A total of 64 sq. mi. in last year's heavily infected areas in Bronx and lower Westchester counties, N. Y., was covered by car scouting in early June. To date 812.5 sq. mi. have been covered in the first systematic scouting, in the course of which scouting has been repeated in the June scouted territory. Thirty-four sq. mi. have been covered to date in the second systematic scouting which has been started in Staten Island, Bronx, Manhattan, and lower Westchester. A grand total of 910.5 sq. mi. has been scouted to date in New York. Of this total 103.7 sq. mi. were covered by car in urban or open-country areas where the efficiency of the work was markedly increased by the use of automobiles.

Eradication and Sanitation Activities

An intensive sanitation program has been undertaken to remove from all elm trees in the immediate vicinity of the infection at Old Lyme, Conn., all dead and weakened parts which constitute a possible source of infection or dissemination of the disease or its insect carriers. Ten climbers started on this work on August 1. It is expected that the sanitation work can be completed by September 15.

Sixteen eradication crews and 52 sanitation crews in New Jersey eradicated 165 diseased trees and 3,830 dead and dying trees. C.C.C. crews in the State worked a total of 1,741-1/2 man-hours and eradicated 461 trees, stumps and logs, with a total of 2,774 diameter inches.

Of the 592 confirmed, standing trees in New Jersey at the end of the week, 308 were in the hands of State eradication officials for clearance. Some 40 were let out on small contracts and had not yet been reported on. Sixty of this total were confirmed on August 3. Two hundred and fifty-six New Jersey confirmations were received during the week.

In New York, eradication is being carried on by 4 Federal crews and 6 State crews. The cities of New York, Rye, Mt. Vernon and White Plains are removing city-owned confirmed trees and are progressing rapidly. One hundred and seventeen Graphium trees were removed during the week. Approximately 18 per cent of the confirmed trees are being removed on State contracts let to private tree companies. The New York scout force for this period was increased to 120 State men and 819 Federal employees.

Work Accomplished

Listed in Table 11 are data showing progress of the work on August 3.

Table 11. Progress of Dutch elm disease scouting and eradication projects. Week ending August 3, 1935.

	Last Week Report	Conn.	New Jersey	New York	Out-side	Present Totals
Scouting Project						
Suspects Coll. This Week	2,700	557	677	881	60	2,175
*DT Tagged This Week	3,045	97	1,519	562		2,178
Total DT Tagged	707,765	131,291	323,218	255,434		709,943
Sq.Mi. Scouted This Week	504.7	49.61	177.70	268.50		495.81
Sq.Mi. Scouted to Date	-	260.28	582.88	846.50		1,689.66
Laboratory Identification						
Confirmed **DED This Week	352	7	256	136	9	408
Total Elms Confirmed DED	9,904	98	6,424	3,781	9	10,312
Total Reported Not DED	13,503	4,374	4,200	6,940	2	15,516
Suspects Unreported	4,784	1,420	1,460	1,553	105	4,538
Total Suspects Collected	28,191	5,892	12,084	12,274	116	30,366
DED Eradication Project						
DED Removed This Week	321	7	165	221		393
Total DED Removed	9,072	84	5,832	3,555		9,471
Total DED Standing	832	14	592	226		832
Sanitation Project						
DT. Removed This Week	13,741	338	3,830	3,491		7,659
Total DT Removed	460,440	82,153	193,787	192,609		468,549
Total DT Standing	247,325	49,138	129,431	62,825		241,394

*DT = dead or dying trees. **DED = Dutch elm disease

SURVEY FOR FLAX DISEASES IN SOUTHERN MINNESOTA

H. H. Flor and C. C. Allison

This survey was made June 10 to 13. Seventy-six fields were examined in Dakota, Goodhue, Rice, Freeborn, Jackson, Nobles, Cottonwood, Martin, Watonwan, Blue Earth, Kandiyohi, Swift, Stevens, and Wilkin Counties in Minnesota and three in Worth County, Iowa.

The most interesting feature of the trip was the prevalence and spread of the browning disease. It was found in every section visited except the Red River Valley, and in some cases appeared to be doing considerable damage. Rust was also widespread, but most of the infections found were in the aecial stage so that little damage had been done. The cool, wet spring had undoubtedly favored the spread of browning and rust, and had retarded the development of wilt and rhizoctonia. Traces of the latter two diseases were found but damage due to them was almost negligible.

In some instances there appeared to be frost damage, but the plants would undoubtedly soon grow out of this.

Following is a summary of the results of the survey:

Browning (Polyspora lini) was found in 18 fields. Thirteen fields showed a trace; one had 1 per cent; 2 showed 2 to 3 per cent; one, 3 to 5 per cent; one, 15 per cent.

Rust (Melampsora lini), found in 13 fields: a trace in 12, 1 per cent in one.

Rhizoctonia found in 8 fields: a trace in 6, 1 per cent in one, amount not determined in one.

Wilt (Fusarium lini) found in 8 fields: a trace in 5, 1 per cent in 3.

Blight (undetermined) in 5 fields: a trace in 4, 3 per cent in one.

Other diseases: Heat canker (non-parasitic) was found in 2 fields, Helminthosporium in 2, chlorosis in 6, an undetermined root rot in one. There was 20 per cent frost injury in one field.
(Division of Cereal Crops and Diseases).

THE STEM RUST SITUATION

E. C. Stakman

(The following report is used through the courtesy of the Bureau of Entomology and Plant Quarantine).

The situation has, if possible, become even worse since the report of July 27. The temperatures were extremely high, and this had a tendency to cause very rapid drying of the wheat, together with crinkling of many of the stems. It is my opinion that the damage to spring wheat in Montana, the Dakotas, and Minnesota will range from 50 to 75 per cent. At present it looks as if it would be at least 60 per cent, and possibly more. Many fields are not being cut. This is true in southern Minnesota, in west central Minnesota, i.e., in the region near Big Stone Lake and Lake Traverse, and is true of many fields in northeastern South Dakota and in the Red River Valley and even westward. Many other fields are being cut but will yield only from 4 to 7 bushels per acre of wheat that will not weigh more than 40 to 43 pounds per bushel. This wheat will command a price of about $16.00 a ton as feed wheat. There are some fields in southern Minnesota and in North Dakota which will yield 6 to 10 bushels of approximately 50-pound wheat. The only fields that will yield normal wheat are fields of Marquillo and Thatcher. It is highly improbable that any of the Thatcher will be used for anything but seed. There are reports now that even Thatcher has rusted fairly heavily in some experimental trials. All of the fields which I have seen, however, have been very free from rust, and the reports of rust on this variety are from regions where the grain is very late. In reality, however, the aggregate amount of Marquillo and Thatcher is so small that it will not affect the market.

During the past two days observations were made over the following route: Minneapolis to St. Cloud, thence to Sauk Center, Fergus Falls, Breckenridge, Fargo, Cassellton, Larimore, Devils Lake, Cando, Churches Ferry, Carrington, Jamestown, and back to Fargo. In this entire trip the only really normal wheat was of the Marquillo and Thatcher varieties, and less than half a dozen fields of these varieties were seen. Marquis and Ceres were almost equally damaged. The only wheat that showed promise of yielding more than 4 to 6 bushels an acre was that which was in the medium dough during the four cool days which we have had since July 1. The aggregate amount of this wheat, however, was extremely small: hence it seems quite accurate to say that the damage to spring wheat will be at least 60 per cent, and possibly more, in the entire area covered.

The only bright spot in the situation is the fact that the durums in the general region around Devils Lake, Cando, and Churches Ferry--almost a solid durum region--will produce reasonably good yields and wheat of fair quality. The rust infection ranges from 40 to 75 per cent, but most of the grain is at least in the medium

dough, and the rust has apparently just about run its course. With fairly cool weather such as prevailed in the durum region on July 31 and August 1, it seems likely that the durums will probably escape really severe damage, although there will be some shriveling. The entire durum area was covered by rain on August 1. Consequently the danger of drying is considerably lessened. Should the weather again become very hot, however, the damage will be somewhat increased. In general, however, it seems safe to predict that the yield of durum will be fair and that the quality will be reasonably good.

In western North Dakota and eastern Montana the condition is somewhat spotted and estimates of the damage are rather difficult. Because of the extremely high temperatures, the situation changed so much from day to day that it seems unsafe to estimate the average loss in that region. There will be some fairly good wheat, but much of it will be virtually ruined. (Aug. 3).

STEM RUST SEVERE IN CANADA

Under the caption "Rust infection worst in Manitoba's history," an Associated Press report from Winnipeg, August 8, states that:

Rust infection in Manitoba is generally agreed to be the heaviest in the history of the province, the weekly crop survey issued by the Manitoba government said Thursday.

Rust, said the report, has appeared in every part of the province, attacking wheat, oats and barley. Heat has combined with rust in damaging all grains.

Bread wheats have fared the worst with some fields in the Red River Valley being so badly hurt that farmers burned them. Durum wheat also is rusted, the report says, though at present this variety promises at least a 75 per cent crop.

CEREAL DISEASES IN NORTHERN GEORGIA

J. H. Miller

BARLEY. The barley varieties in the experimental plots were infected this year with loose smut (Ustilago nuda). This is unusual in Georgia as the common smut here is covered (U. hordei.) The percentages of loose smut according to varieties are given below:

Variety	Percent Infection	Variety	Percent Infection
Tennessee Bearded	.82	Tennessee Hooded	5.24
Argentina Bearded	2.60	Orel Bearded	6.51
Tennessee Winter Bearded	2.71	Nakno Washington Beardless	6.69
Greece Bearded	2.91	Hybrid Beardless--Hooded	6.71
Mammoth Bearded	3.41	South Carolina Awnless	7.88

There was a very small percentage of covered smut--from 0.1 to 1 per cent.

Tennessee Bearded also had 50 per cent powdery mildew (Erysiphe graminis) leaf infection. The other varieties showed no infection although near this one.

Stripe (Helminthosporium gramineum). In one five-acre field in Clarke Co., 40 per cent of the plants were killed by stripe. The seed was not treated, and came direct from Tennessee.

OATS. Loose smut (Ustilago avenae). Percentages of smut according to varieties on the experimental plots are as follows. There was no seed treatment and all were equally exposed.

Variety	Percent Infection	Variety	Percent Infection
Winter Fulghum	.1	Nortex	1.0
Coker Big Boy	.1	100 Bushel	1.0
Appler	.1	Custis	3.0
Kanota	.1	Lee	5.0
Fulghum 100 5-S	1.0	Bancroft	7.0
Coker--Fulghum	1.0	Texas Rustproof	13.0
Norton	1.0		

Crown rust (Puccinia coronata). During the last inspection of oat fields in northeastern Georgia made about June 1, there was practically no rust, only a trace appearing in one or two fields.

RYE. Leaf rust (Puccinia dispersa). During the May inspections rust was found on from 15 to 30 per cent of the leaves. It appeared late and did little damage.

WHEAT. Loose smut (Ustilago tritici) was common in all wheat fields, but appeared to be less in extent than usual. The average loss was from 1 to 3 per cent. No seed treatment was used.

Leaf rust (Puccinia rubigo-vera tritici). This was found on all wheat varieties grown in Georgia. It appeared at least two weeks earlier this year than last, and by April 15 was very prevalent especially on the earlier maturing varieties. It was first observed in experimental plots on April 6, when the leaves of Georgia Red showed about 1 per cent infection.

It is impossible to separate the loss due to leaf rust from that due to leaf-blotch (Septoria tritici). Georgia Red on April 6 also had 40 per cent of the lower leaves dead from leaf-blotch with a few dead areas appearing on the upper leaves. When the rust appeared it attacked only the upper leaves which were still alive. Both organisms then cut down the chlorophyll area, and so reduced the number and weight of grains. The accompanying table does not show the total loss from rust and leaf blotch in the experimental plots but only the increased loss over last year due to the earlier appearance of these two diseases.

Table 12. Comparison of loss in wheat varieties due to leaf rust and leaf blotch in experimental plots, Athens, 1934 and 1935.

Variety	Yields, bushels		Loss in Bushels	Percentage Loss
	1934	1935		
Fulcaster	27.7	24.5	3.2	11.6
Dietz Mediterranean	34.8	29.7	5.1	14.6
Velvet Chaff	28.5	21.2	7.3	25.6
Georgia Red	35	24.7	10.3	29.4
Fulcaster (Stoner)	32.5	20.9	11.6	35.7
Mammoth Red	36	22.7	13.3	36.9
Alabama Blue Stem	38.9	24.5	14.4	37.0
Red Hart	37.1	21.7	15.4	41.5
Gasta	39.6	20.2	19.4	48.9
Fultz	39.7	20.1	19.6	49.3
No. 5977	35.5	17.9	17.6	49.5
Cherokee Light	41.7	17.8	23.9	57.3
Leaps Prolific	47.4	20.2	27.2	57.4

The loss in Cherokee Light was not due so much to rust as to a very poor stand in 1935. In 1934 there was more glume blotch (Septoria nodorum) on this than on any other variety and at least half of the seed planted in 1935 did not come up. The other varieties had about equal stands and equal environmental factors, as they were in replicated plots.

From these figures one could conclude that the earlier appearance of rust and leaf blotch has in this instance caused an increase in loss of from 11.6 per cent to 57 per cent of yield. This is only a difference of from two to three weeks in time of rust appearance.

Inspections were made in many fields throughout northeast Georgia. In most the varieties planted were Georgia Red, Purple Straw, Red Hart, and Blue Stem. By May 1, with the wheat in the milk stage, half of the leaves were dead and the upper half were yellow with some green areas, and by the middle of May, when most of the wheat was approaching the dough stage, all of the leaves were dead and at least two-thirds of the stem.

In one 200-acre field of Red Hart in Hancock County by May 9 the lower two-thirds of the leaves were killed by blotch and the upper third practically dead from rust, and there was also some powdery mildew. Last year with little rust this field averaged 40 bushels to the acre. This year there was a reduction in yield from that of last year of about 25 per cent.

The average reduction in yield in Georgia this year due to these diseases must be at least 50 per cent. This may seem high, but yields reported by farmers this year are about half of those in years with little rust.

Leaf blotch (Septoria tritici.). This disease has been underestimated in reports coming from the southern states. It appears much earlier than the leaf rust and destroys more leaves. Many fields were found this year, as well as last, in which the leaves were destroyed by blotch before the leaf rust appeared. Loss estimates will have to be included with leaf rust.

Glume blotch (Septoria nodorum). Very little of this disease was found. There was some, about 15 per cent in Cherokee Light on the experimental plots. Infected heads mature light and germinate poorly.

Stem rust (Puccinia graminis) is, as a rule, extremely rare in Georgia. This year it appeared at Athens on very late maturing varieties such as Dietz Mediterranean and Fulcaster, but too late to do any appreciable damage.

One small field of Wood's Abundant near Dahlonega, Georgia, was heavily infected with this rust June 10. At the same time in mountain valleys in Union County, just north of there, there was chiefly Fulcaster with no stem rust but some leaf rust.

Wheat nematode (Anguillulina tritici) has been present in a small area in Hart County, but this year it was discovered on one farm in Franklin County. Of the wheat inspected about 40 per cent of the grains were galls.

Southern blight (Sclerotium rolfsii). Spots in one field near Waynesboro, and in another in Hancock County were found with wheat plants destroyed by Sclerotium rolfsii. The areas were isolated and not spreading. (College of Agriculture, Athens).

INFORMATION WANTED ON THE OCCURRENCE OF ONION DOWNY MILDEW

The Survey has had a request for information on the occurrence and prevalence of onion downy mildew this year. The only report received so far is the one from Massachusetts quoted below. Reports from collaborators in other States will be appreciated.

VEGETABLE DISEASES IN MASSACHUSETTS

O. C. Boyd

POTATO LATE BLIGHT (Phytophthora infestans): The earliest finding of late blight this year, so far as I know, was on July 27 when R. J. Haskell and I located a very light infection in an unsprayed patch of Green Mountain in Sunderland in the Connecticut Valley. This is an unusually early date for the appearance of the disease in Massachusetts, although it has been observed in July in past years. On August 9, more or less widespread distribution of the disease was noted in a poorly sprayed field of Green Mountain in Hampden County, which is also in the Connecticut Valley. Even though no rains have fallen for over two weeks, there was evidence of rather rapid spread during that period, which has been marked by a series of cool, damp (dews or fogs) nights. This disease has not been reported yet this year on tomatoes. (Aug. 10)

YELLOW DWARF OF POTATO: County agent W. T. Locke of Hampden County reported to me recently the occurrence of a disease in Carmen potatoes answering the description of yellow dwarf. The seed came from Fairport, New York. The grower has been using this variety for several years. When I examined the fields on this farm yesterday, at least 5 per cent of the hills, with either primary or secondary infection, had already died or were dying, while an additional 5 to 10 per cent showed varying degrees from a trace to severe. Apparently, a plentiful amount had been introduced either with the seed or by very early feeding of viruliferous hoppers. (Aug. 10)

BLAST OF ONION: One of the worst cases of the non-parasitic disease known as blast that has affected Valley onions in recent years is now cutting in half the yield of seed-onion fields throughout the onion growing area. The later the fields were seeded, the more severe is the injury. Considerable damage was done even to the later set-fields; and many of the thickly seeded patches for set production to set the 1936 crop are reported to be much below standard in bulb formation, both in size and in firmness or quality. Blast was noticeable about the middle of July, and by the last of the month had destroyed many fields and caused severe damage to the others (seed onions).

Blast appears to be due to hot muggy weather following a prolonged period of weather conducive to the development of tender, succulent tops and undersized root systems. It is manifested at first by the development of many small, oblong whitish spots scattered over the tops, withering and drying up of the leaf tips, and eventually dying and collapsing of the entire top. Blasted fields appear grayish-white from a distance. No fungi or other disease organisms are noticeable at the onset of blast. (Aug. 5)

DOWNY MILDEW OF ONION (Peronospora destructor = P. schleideni): W. H. Davis reports that he first observed this wet-season disease about July 25, mostly as light infections limited to wet spots in the fields of both set- and seed-onions. By the first of August, considerable spread had been noticed generally. Whatever damage it may do from now on, however, even in the latest seed-onions, will be greatly overshadowed and minimized by that due to blast. (Aug. 5).

VARIOUS REPORTS ON DISEASES OF VEGETABLES AND SPECIAL CROPS

BACTERIAL WILT OF TOMATO IN ILLINOIS: Bacterial wilt (Bacterium solanacearum) has been causing considerable damage throughout the State this season in fields planted with plants from Mississippi. So far, the disease has not appeared on plants from Georgia or on those produced in Illinois. (K. J. Kadow, Aug. 8).

RUST ON PEAS IN MAINE: A specimen of rust (Uromyces fabae) was sent in by Florence L. Markin, with the statement that: A trace of rust was found on July 20 at Highmoor Farm. Now it is fruiting abundantly on a few leaves. I have not seen late peas in southern Maine this year and I did not find rust on early plantings. About August 1, 1934, it was abundant at Highmoor, Cumberland, Wells, and Kittery, usually on plants heavily infected with powdery mildew. (Aug. 6)

WILDFIRE ON TOBACCO IN MASSACHUSETTS: Wildfire (Bacterium tabacum) was first brought to my attention by C. V. Kightlinger who observed it about July 25. I have seen it since in several fields, but in no instance was there advanced development with severe injury. The present dry spell should keep it at a standstill. (O. C. Boyd, Aug. 5).

SOME REPORTS ON FRUIT DISEASES

APPLE RUST IN ARKANSAS: Apple rust (Gymnosporangium juniperi-virginianae) was rather more common than usual. It appears to have been confined to the foliage this year, however, very little fruit injury appearing. (Edgar F. Vestal, Dept. of Biology, Arkansas State College, Jonesboro. July 20).

DISEASES OF PEACH IN ARKANSAS: Brown rot (Sclerotinia fructicola) has been more than usually severe in northeastern Arkansas this season, some orchardists reporting practically 100 per cent loss. In some cases the rot has been associated closely with scab (Cladosporium carpophilum). Where scab was poorly controlled peaches suffered severely. A series of rains following a light drought caused the fruit to swell rapidly during ripening, and many of the scabby peaches cracked across the dead area. A count in one orchard near Jonesboro showed

that fully 90 per cent of the peaches attacked by brown rot were those cracked from scab injury. (Edgar F. Vestal, July 20).

FRUIT DISEASES IN THE OZARKS OF MISSOURI: Apple scab (Venturia inaequalis) was first observed on new growth and water sprouts of unsprayed Red Delicious on July 24. Since then scabbed twigs have been found on the varieties King David and Missouri Pippin. Lesions are generally small but numerous.

It is believed this is the first recorded instance of scab on apple twigs in the Missouri Ozarks.

Infection of pear foliage and fruit by Fabraea maculata has been unusually severe this season. At the present time many pear orchards are almost entirely defoliated because of this disease.

Sour cherry plantings have suffered severe damage from infection by Coccomyces hiemalis. In some plantings defoliation was complete before harvest.

A serious infection of sooty blotch (Gloeodes pomigena) has been observed in certain unsprayed orchards near Springfield. (M. A. Smith, Ozark Fruit Disease Laboratory, Springfield, Mo. Aug. 9, 1935).

CALIFORNIA BLIGHT ON PEACH IN ILLINOIS: A specimen of California blight (Coryneum beijerinckii) was received from Congerville. Injury was reported as rather extensive on the fruit. The grower had applied a dormant spray.

This disease may possibly become more serious but at present it is encountered only rarely. (H. W. Anderson, July 23).

JULY WEATHER

The following discussion and the maps accompanying it are taken from the Weekly Weather and Crop Bulletin, issued by the Weather Bureau, for the week ending August 6, 1935.

July Warm and Mostly Dry. July had extremely high temperatures throughout the interior of the country, and seasonable warmth in the extreme South and Southeast. Rainfall was ample to heavy in most sections east of the Mississippi River, but was scanty and markedly deficient in many areas to the westward, with very few localities having as much as normal. As during the extremely hot July of last year, the abnormal heat centered in the area from western Missouri and eastern Kansas northward, though this year the temperatures averaged slightly lower in the Kansas-Missouri area. Kansas City, Mo., Topeka, Kans., and Lincoln, Nebr., each averaged 9° above normal compared with 10°, 10°, and 11°, respectively, in July, 1934. On the other hand, Amarillo,

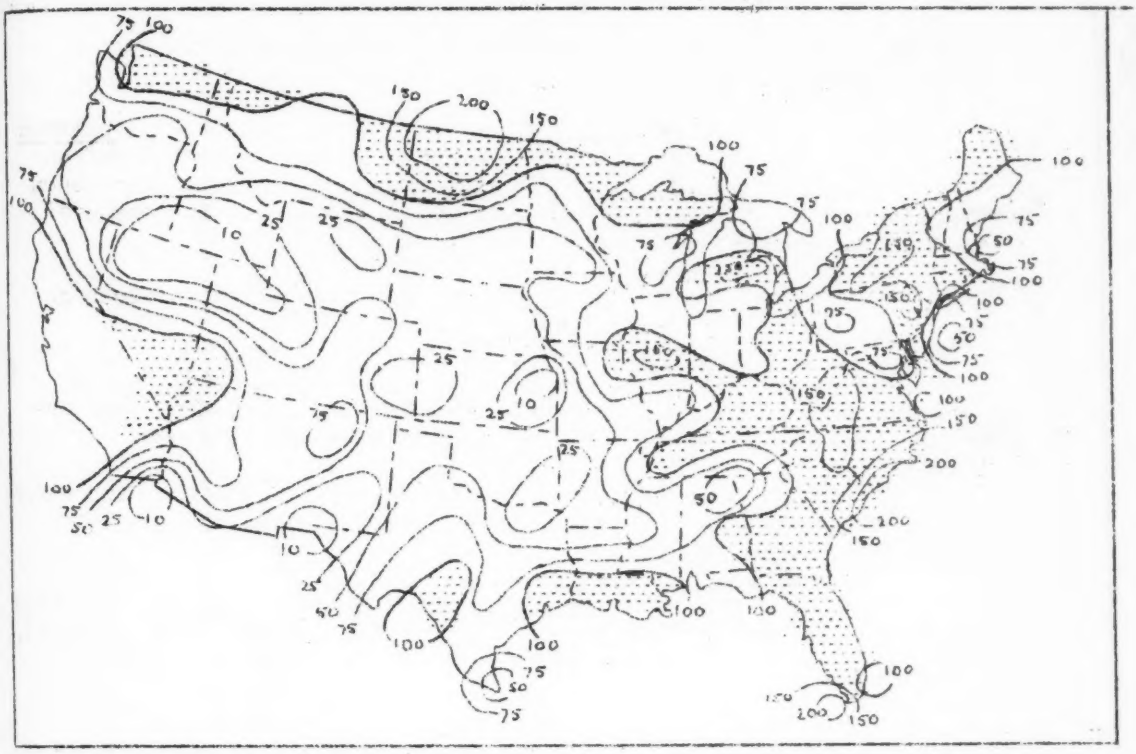

Fig. 50. Percentage of Normal Precipitation for July 1935. Shaded, above normal; unshaded, below normal. Lines show percentage of normal.

Texas, with 8° above normal this year, and Huron, S. Dak., with 9° above, were 1° and 3°, respectively, warmer than this month last year. For July, 1935, all stations, except those along the south Atlantic coast, and a few isolated ones in the Southwest and far West, had above normal temperature.

Figure 50 shows, for different sections of the country, the July distribution of precipitation in relation to normal. Except in the East, and a few limited localities elsewhere, moisture was scanty and was markedly deficient in nearly all sections from the Mississippi Valley westward. The south Atlantic area and southern Appalachian sections mostly had heavy rains, while the amounts were excessive in the interior of the Northeast, especially in parts of New York. In the Great Plains some generous falls occurred in the extreme north, but otherwise the monthly totals were mostly less than half the normal. Parts of eastern Kansas and most of the Great Basin had practically no rain during the entire month.

1935 Weather More Favorable. The weather during the growing season of 1935, up to the end of July, was variable, but decidedly more favorable for crops than during the same period last year. March had heavy rains in the central Mississippi Valley, while in April and

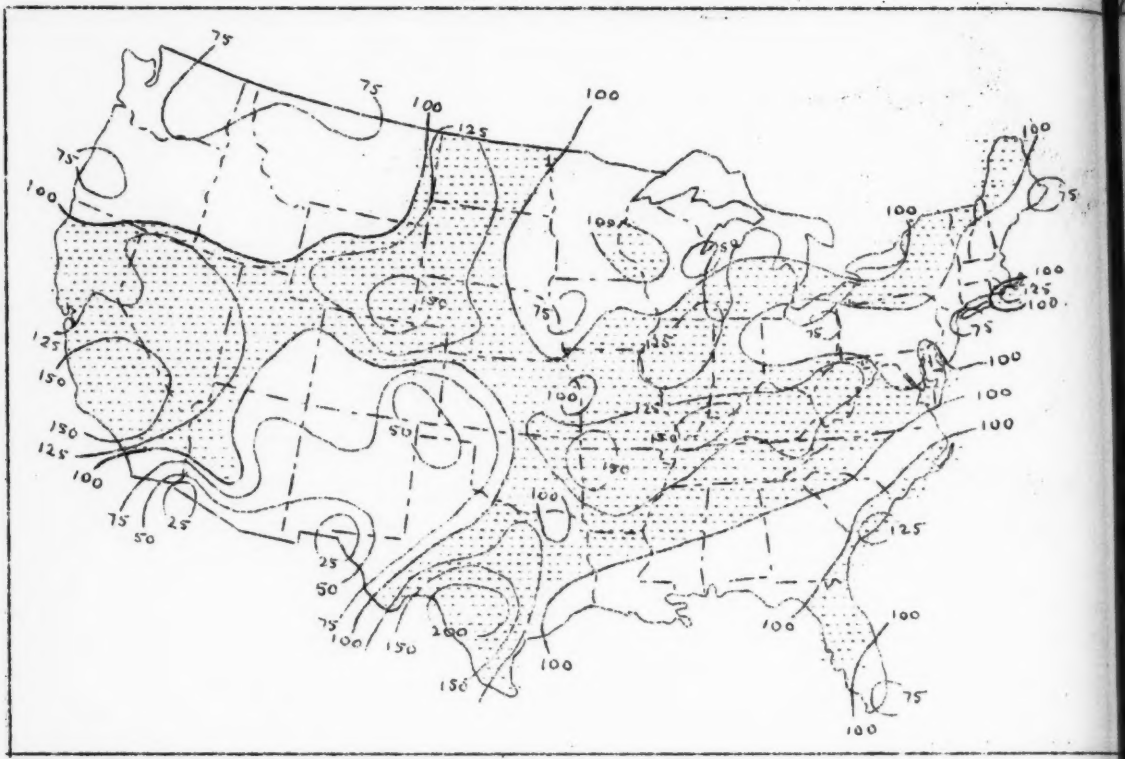

Figure 51. Percentage of Normal Precipitation, March to July, inclusive, 1935. Shaded, above normal; unshaded, below normal. Lines show percentage of normal.

May there were flood-producing falls in the Midwest, resulting in serious damage, especially in Kansas, southwestern Nebraska, southeastern Wyoming, and eastern Colorado. Following these heavy rains June and July had scanty precipitation from the Great Plains westward, but east of the Mississippi River moisture was generally sufficient for crop needs, except in limited areas. At the end of July rain was badly needed in most sections from the Plains States westward.

Figure 51 shows the percentage of normal precipitation for the 5 months from the first of March through July. For this period, as a whole, moisture was very scanty in the southwestern Plains and extreme western Texas, where some places had only half of the normal rainfall, while it was also rather markedly deficient in Montana, Idaho, and the north Pacific area. Elsewhere the 5-month totals were near or above normal, and over much the greater portion of the country east of the Rocky Mountains more than the usual amount of rain occurred, with some sections having 50 per cent or more in excess of normal.

The first part of the season was abnormally cool in the central-northern States with subnormal temperatures running through June, but July was persistently warm, with temperatures almost continuously above normal. For the 5 months the temperature averaged just about normal in practically all sections of the country.